New Directions in Environmental Policy

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Commonwealth and state governments allocate significant resources to natural resource and environmental management. In Australia, the Natural Heritage Trust annual report for 2000-01 shows that this federal program will have committed approximately \$2.5 billion to environmental works by June 2007. State and Federal Governments have allocated a further \$1.4 billion to The National Action Plan for Salinity and Water Quality over a seven-year period. These and other environmental and natural resource management programs employ a combination of intervention mechanisms including community and catchment-based planning, voluntary programs, fixed-price subsidies and grants, education programs and capital works programs.

Although there is general acknowledgment that these programs have altered community awareness about environmental issues, there is not a widespread belief that these programs have *cost-effectively* achieved significant on-ground outcomes. For example, the Australian National Audit Office (2001) commented on the Natural Heritage Trust by saying that the program has been successful in 'raising awareness and empowering communities, fostering integrated planning...but few projects have the potential to lead to broad scale long term landscape outcomes...and is...poor in monitoring, administration and cost shifting'. Thus, while achieving an attitudinal shift, these programs have been less effective at delivering and demonstrating improvements in the environment.

This paper addresses the incumbent policy failures and seeks to posit some possible additions to the environmental policy toolkit. We proceed by first delineating the nature and existence of an 'environmental problem'. Second, a discussion of the existing policy approaches is undertaken. The third section of the paper, on a new policy framework, necessitates an investigation of the role of markets in the environmental landscape. Finally, we conclude with some observations on the importance of future research, both in terms of policy mechanisms and institutional design.

How Environmental Problems Arise

In order to assess the state of environmental policy, and to posit changes in that policy, we must start with an understanding of the genesis of environmental

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problems themselves. At a macro level, economic growth and population growth lead to an increase in demand for most resources. Furthermore, environmental goods appear to be mostly normal goods (the value that people place on them rises with income and education), which are in fixed or limited supply. As such, it is likely that the social value of environmental resources will continue to increase rapidly.

Many goods are effectively priced and marketed in the economy, but many are not. The economic (or social) value of marketed goods is generally reflected in their market value, and with some exceptions that are well understood by economists, market mechanisms allocate resources efficiently. Of course this does not apply to non-marketed resources. There are many environmental resources that are not adequately valued through the market system. Further complexity arises when it is acknowledged that environmental resources often yield multiple outputs, some of which are valued by the market while others are not. For example, land can be used to produce crop and livestock commodities, which have readily observable prices, but this same land could be used to sustain populations of native plants and animals which are not valued in markets.

It is generally acknowledged that existing markets and institutions misallocate resources to environmental goods and services. Markets are generally efficient in allocating resources to 'exploitation activities' but may be ineffective with respect to investment in environmental conservation. Commodity markets, for example, provide clear signals to individual landholders about the value of clearing land for agricultural production, yet markets for conservation actions are missing or inefficient. The social value of the non-marketed outputs may be rising (or falling, in the case of bads like greenhouse emissions) even more rapidly, but these values do not have a voice in the marketed part of the economy. In particular, when making tradeoffs across different activities, people only observe those underlying values that are priced through the market. It is this incompleteness of markets that results in a distortion of resource allocation from the 'efficient', or value maximising, outcome. The result is a squeeze on environmental resources.

There are two broad policy approaches to dealing with this problem. One is to delineate a clear boundary around the marketed part of the economy. This serves to protect the environment by mitigating the risks of exploitation. This is a natural reaction, and it is the basis for a great deal of existing policy. The other is to change the boundary between the marketed and non-marketed part of the economy, curing the problem at its root. A combination of both approaches will probably always be optimal. The thesis of this paper is that new developments in science, technology and in economic theory allow us to shift the mix of policy instruments that define this boundary in ways that were not possible before. Some examples of new policy approaches to environmental problems that demonstrate this proposition are briefly discussed later in the paper.

Existing Policy Approaches and their Limitations

Environmental policy makers have relied on a mix of policy mechanisms including command and control, market-based approaches, education and attitude change. In Australia, emphasis has been placed on policy mechanisms that foster voluntarism (for example, Landcare, Clean up Australia) and legislation (for example, the *Planning and Environment Act 1987*). Concerns about the effectiveness of the environmental policy mechanisms employed by governments in Australia are beginning to be raised. Despite significant progress made overseas, relatively little attention has been given in Australia to the application of changing market institutions to address environmental and natural resource management. In effect, Australia's approach to environmental policy has been to 'fence-off' the environment from the remainder of the economy, and hence, limit its exposure to the organising influences of market processes.

Governments around the world are wrestling with the changing issues associated with the use and degradation of natural resources and the environment. The broad gambit of concerns includes, current and future viability of natural resources (sustainability), appropriate valuation methodologies for environmental assets, and transboundary degradation. An important common thread across these is that of opportunity cost. The environmental and natural resource issues associated with land illustrate this problem. Land can be used to supply agricultural commodities, biodiversity, carbon sequestration and other water and air quality services. When land is used to grow crops and livestock, it has an associated opportunity cost in terms of the viability of the future use of that land in. There is much debate about the monetisation of these costs, as they require some weighting of current versus future use (in economics parlance there is no agreement on the appropriate 'discount rate'). Where land is cleared of native vegetation there is also a loss of biodiversity that involves an implicit opportunity cost. Finally, the transboundary concerns (where environmental impacts cross over different geographic boundaries), and the associated international trade policy discussions through the medium of bodies such as the WTO, highlight the fact that the opportunity cost of degradation is probably not internalised by nations, let alone firms.

Policy makers have long recognised the economic and political constraints in executing 'good' environmental policy. In short, the critical components are the definition of 'good' and the efficient implementation of the policy. The environment represents a complex area of public policy. Evaluation of what ought to be considered 'good' policy benefits from recourse to the fundamentals of economics. In particular, value creation, as defined by the boundaries of the customers' willingness-to-pay and the suppliers' opportunity cost, is an important lens by which to view the efficiency component of policy objectives. Difficulties arise because of changing consumer preferences over environmental goods with consequential implications for the willingness-to-pay for environmental assets vis-à-vis other assets. Difficulties also arise because the complex spatial and temporal biophysical interactions associated with the environment that renders the other

side of the value equation — the opportunity cost — ill-defined. Moreover, the inertia of existing policy mechanisms employed in this area of the economy hinders change.

The complexity of environmental policy reform need not, however, render the task of developing more efficient environmental mechanisms completely intractable. What is required is a systematic, and not merely a politically expedient, approach to address the concerns around use of natural resources. Much environmental policy around the world, to date, has suffered from some common pitfalls. The approach to the environmental landscape has tended to be incoherent, partial and piecemeal. Biodiversity, water quality, dryland salinity, forestry, genetically modified organisms, pollution, and farming cannot be viewed as individual concerns warranting policy directives that address the political and economic considerations in isolation. These dimensions of the environment are interconnected in complex ways and intervention in the landscape can generate both environmental goods and bads.

Current environmental management policies suffer from three specific problems. Firstly, there is insufficient information on which to make reasonable choices, and there is often an implicit assumption that there are standard benefits from intervention across the landscape. For example, it is tempting to suggest that planting millions of trees can rectify dryland salinity in the Murray-Darling basin. While trees may slowly ameliorate groundwater pressure (the cause of dryland salinity) they quickly reduce surface water flows into streams and rivers. Reduced surface flow raises the salinity of waterways degrading habitat and reducing irrigation yields. Heaney *et al.* (2000) modelled these types of interactions that are now being observed in some regions of Australia. Further, tree planting does not necessarily improve biodiversity — plantations are just another form of monoculture that does not provide the complex habitat structures and diversity provided by native habitat.

Secondly, policy directives have often failed to take into account the incentives of individual agents and the way that policy influences behaviour. The introduction of legislation to limit the clearing of vegetation on private land has often resulted in pre-emptive actions by landholders incorporating the future impact of such legislative change in their underlying costs. Moreover, dichotomising policy formulation from implementation has often resulted in a failure to adequately think through the informational requirements of efficient policy implementation. Finally, the absence of ex-post measurement and accountability processes has limited policy learning and evolution.

There are several important attributes of the environment that need to be considered when formulating policy responses. Each case needs to be judged on its peculiar merits. There are non-standard benefits derived from intervention in the environment. What is often missing from current environmental policy mechanisms is a well-developed schematic for understanding and measuring or estimating the multiple attributes of environmental assets. From a societal perspective what is required from our policy makers is a methodology for revealing site-specific information about the trade offs associated with using

natural resources and their impact on the environmental landscape. This amounts to tightening our understanding of the bounds of value creation (the willingness-to-pay and the opportunity cost) of landscape interventions that impact on the environmental assets.

Successive governments at both State and Federal levels have allocated significant funds to environmental concerns. Sadly, there has been little accountability of impacts on the public purse, both in terms of proposed change and on the effectiveness of policies that are implemented. A systematic method of ranking environmental policy directives would yield not merely more efficient outcomes, but also provide some discipline to the environmental reform agenda. This is particularly important when we recognise that one of the limitations to policy reform has been an institutional framework that rewards rent seeking behaviour. While the distortionary impact of rent seeking in the political arena is well understood, rent seeking at the institutional level may be equally important with respect to the environment.

A New Policy Framework

Managing the environmental landscape and its implications for policy are in some respects similar to management of any capital asset. It is widely accepted that traditional markets are insufficient institutions where they fail to adequately reflect externalities and social costs. A coherent policy framework must begin with a diagnosis of environmental problems as economic problems. Further, a clear delineation of the feasible policy objectives, which are gleaned from scientific research and market information, needs to be coupled with the design requirements of potential implementation methods. As evidenced by numerous corporate debacles around the world, the efficacy of well conceived strategy is limited by the ability to deliver, or implement the strategy. That is, some failures in the corporate realm are not due to badly conceived strategy (although, admittedly, many are), but rather a lack of understanding of the process of implementation and its associated costs. The same holds true in environmental policy. Seemingly well-conceived policies are derailed by a failure to understand the constraints to efficient implementation. A critical component, missing in the current policy domain and yet imperative for environmental reform, is the need for a transparent, open policy design process that is subject to criticism and peer review. The move towards a coherent, transparent and integrated policy framework for management of the environmental landscape would entail input from scientists, engineers, economists and other specialists.

The Role of Markets in the Environment

Economists have long recognised that the market process has implications for human behaviour. In redesigning the environmental policy framework we are suggesting recourse to scientific and economic theory to potentially push out the boundary between the marketed and non-marketed parts of the economy. If they

are well designed and efficiently operating, markets provide a harmonisation of values, decisions and actions. This is the oft-cited discipline of the market process. On the supply side, when dealing with environmental goods, the direct effect of the market is the ability to procure at least cost. An important indirect effect of the market process is behaviour change that occurs from involvement in the market itself. That is, price signals in a market for biodiversity conservation yield not just conservation at least cost, but an awareness of previously unpriced environmental assets that may impact on behaviour in other parts of the environmental landscape. Similarly, on the demand side, the market process forces a reallocation of conservation efforts to where the value is the greatest. A further benefit of markets in environmental goods is the possibility of cooperation and teamwork between different programs and the recognition of the opportunity costs of pursuing one program over another. Finally, from the information revelation perspective, the full social value of environmental resources becomes evident through the market process, as well as the costs of enhancing them. This is a valuable input into policy design.

It is unlikely, given the complex nature of the environment, that markets for environmental goods and services will resemble more familiar institutions such as commodity markets. Markets in the environment, no matter how well designed, will not completely correct the complex issues that underpin missing or incomplete environmental markets. Too frequently, rhetoric about the potential for developing environmental markets has been simplified and idealised, unduly raising expectations and diminishing the difficulties of the task. This point is made by Pannell (2001).

Coase (1937) identified 'transaction cost' as the main obstacle to the existence of markets. Today this vague concept is better understood, and it is known that information problems lie at the root of most missing markets. Once this is understood, there is the possibility of addressing the problem directly through the use of modern technology and clever institutional design. The basic reason that asymmetric information destroys markets is that it is hazardous to do business with someone who has relevant but hidden information. In general terms, environmental problems bear similarity with the market for 'lemons' (Akerlof, 1970). Akerlof showed that the existence of asymmetric information (that is, where one party is informed about aspects of the economic problem and the other is not) can render some seemingly competitive markets inefficient. In the limit, this phenomenon can result in the non-existence of markets. The uninformed party, in many environmental problems, is liable to be exploited and may be unwilling to participate. Because of this, the potential benefits of doing business (which may be very large) may not be realised. For example, sellers of organically grown produce may not find a market because the uninformed public is liable to be cheated by fraudulent products. The answer in this example has been to create a certifying body that corrects the information imbalance, and this is typical of the intervention that is required. Something must be done to improve the information structure in order for the market to work effectively.

Markets for environmental goods and services can be characterised as the interaction between government, on behalf of society, and individual agents in the economy. In the case of environmental policy, the uninformed party has overwhelmingly been the general public. If the contributing public does not know how the money has been spent, how much has been dissipated in administrative inefficiency, what has actually been done on the ground, and whether there is any link between the actions and environmental outcomes, then there can be no confidence in the policy agenda. This lack of confidence may be one reason why volunteerism has been important in the provision of environmental goods (for example Landcare and anti-litter clean ups). Although voluntary action may not be very efficient, the volunteer can at least monitor outcomes and has an interest in doing so. It is our thesis that public willingness to pay for environmental assets is greatly diminished by the informational asymmetries that are inherent in many environmental issues. It is for this reason that transparent and objective program evaluation is a key step in improving the management of the environmental landscape.

There are now a number of examples of environmental policies that reflect more contemporary economic ideas and that utilise improved scientific and information capabilities. Where property rights are well defined, such as with point-source pollution, there are now many examples of tradable emission schemes. Tradable pollution permits allocate the pollution control burden amongst firms or individuals by employing the market as the information exchange mechanism. In this sense, individual firms, not government, make the decision to reduce environmental damage based on the marginal cost of abatement.¹ Some firms will make no change while others will be able to reduce environmental damage in very cost-effective ways and gain by selling pollution credits. These different responses by different firms simply reflect the fact that there is considerable variation in the cost of abatement between firms. The tradable emission market is constructed to allow the economy to discover these differences in abatement costs and take advantage of abatement actions that are low cost.

There is also growing interest in applying mechanisms that arise from application of the information economics literature to some environmental management problems. The design and public policy issues associated with eco-labelling is now seen as a problem of information asymmetry between producers and consumers of good where the impact of production processes on the environment has credence attributes (that is, attributes that cannot be discerned by consumers even after experiencing the good).²

Auctioning of conservation contracts is another example of the practical application of an information perspective to previously intractable environmental management problems. In Victoria, for example, a pilot auction of biodiversity

¹ See Tietenberg (1985) for a detailed discussion on emission trading.

² See Emons (1997) for a more detailed discussion.

conservation contracts, BushTender, has proven to be an efficient and popular policy mechanism for engaging private landholders in biodiversity conservation.

Latacz-Lohmann and Van der Hamsvoort (1997) explain how there is an 'information problem' with respect to the market for environmental goods and services associated with private land. They note that there is a 'clear presence of information asymmetry in that farmers know better than the program administrator about how participation (in conservation actions) would affect their production plans and profit'. The cost of supplying additional biodiversity services from private land is hidden and can be addressed through the market design (the auction). Dealing with conservation on private land as a problem of asymmetric information has improved our understanding of why related environmental markets are missing or ineffective and introduced alternative policy mechanisms to those in current use. Auctioning biodiversity conservation contracts offers many advantages over planning, command and control, voluntary approaches and fixed price policy mechanisms. This is not to suggest that auctions are always a viable replacement for these other mechanisms. It does, however, add an important new mechanism to the environmental policy tool kit.

Many important design issues have been addressed in the process of implementing the auction. Besides choices about auction format, contract design and the specification of biodiversity preferences, many practical but important choices arise concerning communication with landholders, skills required to successfully run an auction and timing of activities. These factors all influence the performance of the auction.

The success of the auction can be principally ascribed to its ability to *reveal* the information needed to make good biodiversity conservation decisions. The auction for biodiversity conservation was designed to reveal specific information from the agency responsible for increasing biodiversity conservation and from landholders. As part of the auction, the agency revealed information about the improvement in biodiversity associated with changes in land management (the Habitat Services Score), and the agency revealed *some* information about the relative conservation status of different areas of vegetation (the Biodiversity Significance Score). This information would significantly improve priority setting for biodiversity conservation, whatever the mechanism employed.

Another factor contributing to the cost-effectiveness of the auction-based approach is that it enables an agency to take advantage of heterogeneity in landholders' opportunity costs. Many landholders participating in the auction were clearly prepared to cost-share with the Government to conserve biodiversity. Some were willing to bear nearly all of the costs of managing biodiversity while others offered bids that reflected financial opportunity costs. Hence, landholders' bids exhibited substantial variation if they are compared purely on a cost-basis. However, the differences in the bids became even more exaggerated when they were ranked according to the biodiversity benefits index, which combines cost information with benefit information. An empirical analysis of the BushTender application is undertaken by Stoneham, Chaudhri, Ha and Strappazzon (2002).

The auctioning of conservation contracts also demonstrated the importance of the scientific disciplines in measuring and modelling expected outcomes from alternative environmental intervention strategies where the non-standard benefit problem, noted earlier, arises. New scientific innovations to old measurement problems, sometimes using remote sensing and/or on site monitoring greatly assist the prospect of developing markets for environmental goods and services. Interaction between economics and science becomes even more powerful when economists can clearly define the specific missing or hidden scientific information needed for markets to establish.

As with all auctions, attention to mechanism design and contract specification is paramount. Klemperer (2000) notes that 'auction design is a matter of horses for courses, not one size fits all'. Efficient auction formats will reflect the objectives of the seller, the nature of the assets, and the specifics of bidder characteristics. For example, avoidance of collusion, the heterogeneity of parcels of land, and bid aggregation issues all impact on the specificity of auction design. Contract design is a particularly important aspect where agreements extend over time as is the case with contracts for environmental management. It may be unknown, for example, whether the contracted actions have been undertaken. This can be addressed through monitoring, and also through an output based component to compensation. The balance between rewarding on the basis of inputs and outcomes would depend on the relative difficulties of monitoring these, and the risk burden on the supplier. Since the causal links between actions and outcomes are probably not well understood, scientific research and monitoring may be used. Further, the environmental value of the good (value to the buyer) may not be known. This can be addressed through a tendering market on the demand side, or through Coasian bargaining between different demand interests.³ Finally, the effectiveness of the implementation package (that is, the incentive/market measures and the link between actions and outcomes) may be unclear. This can be addressed by *ex-post* evaluation.

Conclusions

Managing the environmental landscape is a complicated endeavour that requires a coherent integrated policy design process. A major lesson learnt from past failures is that policy design needs to be system wide, not ad hoc, and that it requires the input of scientists, economists and other specialists. Planned or regulatory approaches to management of the environmental landscape do not address information asymmetries inherent in the system. There are now a number of relevant environmental policy mechanisms that appear to offer significant improvements over those used in the past. Increased use of well-developed

³ Coase (1960) argued that in the absence of transaction cost impediments, individual interests will exploit all opportunities for valuable trade. His claim essentially invalidated the need for Pigouvian taxes and subsidies if individuals were free to costlessly bargain with each other to exploit all gains from trade.

concepts relating to tradable emission permits seems appropriate for a range of environmental issues where property rights are currently or potentially well defined. These applications include greenhouse emissions, water quality management and air quality management.

Designing markets to reveal hidden information, particularly when coupled with new approaches to the measurement of environmental stocks and flows, also offers significant potential to improve the efficiency and effectiveness of environmental policy where property rights are not clearly defined. Developing specialised auctions for diffuse-source pollution and nature conservation associated with private land-use appears to be a theoretically sound and now practical approach to this class of problem. Dryland salinity, biodiversity conservation, some water quality issues amongst others are important and hitherto intractable environmental problems that are likely to benefit. For this class of environmental problem efficient outcomes depend on ranking of different possible uses of natural resources in the context of their impacts on the environmental landscape and on the revelation of hidden information about opportunity cost. In some dimensions this lies in the domain of scientific endeavour, while in others, information of this sort lies in the hands of individual agents in society.

Moreover, recourse to economic theory to help develop methods for constructing market institutions that efficiently reveal and aggregate information, will push out the policy frontier (that is, the fence between the marketed and non-marketed parts of the economy can be pushed further out). Finally, there are some significant obstacles to new environmental policy design and implementation. The most obvious, is that incumbent decision makers within the current institutional setting may be reluctant to adopt methods that potentially whittle away the opportunity to appropriate political or institutional rents. As important as well designed policy is the institutional support for efficient implementation. The link between policy design and institutional arrangements in environmental management is a field of applied policy research that warrants further investigation.

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The authors are grateful to the Editor and two anonymous referees for comments on an earlier version of the paper.